



Penn Engineering



CONTENT

Penn Engineering / Spring 2015
University of Pennsylvania
School of Engineering and Applied Science

"Economics has transcended business and has become not only a business tool, but also an engineering tool. Penn is now leading the discussion on connecting the technological world with economic foundations."

3 Makers & Learners

IPD student-entrepreneurs create a sewable electronics kit to engage a new generation.

"Because of the basics I learned in these classes, I was able to draft a marketing strategy, build a cost analysis and manage the project."

7 From Kicks to Kinematics

Scholar-athletes Erica Higa and Eric Schultz combine determination and drive to power success.



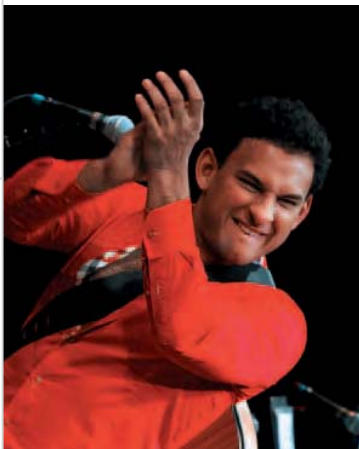
12 Turning the Tables

A redesigned Active Learning Classroom provides a novel approach to learning.

"Hearing another perspective helps me to better understand the material and also helps me to learn."

16 Next-generation Engineer

Venmo founder and musician Iqram Magdon-Ismail creates more than tech.



19 First Jobs

Six Penn Engineering students discuss strategies for landing "the first job."



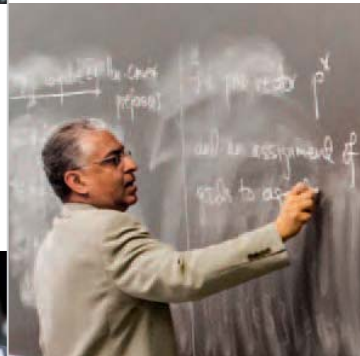
26 Leaving a Legacy

Celebrating Bill Hamilton's 35 years as director of M&T, Penn's first dual degree program.

"I have been privileged to participate in the creation and development of new and lasting institutions at my alma mater."

32 Using Math to Engineer Social Systems

Rakesh Vohra uses mathematics to pioneer new ways to address important societal issues.



36 Lloyd Howell

Overseer Lloyd Howell provides transformative expertise in support of future engineers.

"As an Overseer, I have been asked to give advice on recruiting talented professors and minority students, increasing the diversity of the Board, and keeping the school competitive."

COVER

"Penn Engineering graduates are among the most well-prepared in the country, and employers across all industries are competing to recruit them because of their proven educational, research and work accomplishments."

*Rosette Pyne
Career Services
University of Pennsylvania*

Penn Engineering Magazine

alumni@seas.upenn.edu
215-898-6564
www.seas.upenn.edu

Eduardo D. Glandt
Nemirovsky Family Dean

George W. Hain III
Vice Dean, External Affairs
Development and
Alumni Relations

Joan S. Gocke
Director of Communications
Editor

Design
Kelsh Wilson Design

Photography
Kelsh Wilson Design
John Carlano
Roger Miller



Eduardo D. Glandt/Nemirovsky Family Dean

A Perfect Moment

The beautiful cover says it all: a degree from Penn Engineering empowers our students; it lifts them and allows them to soar. The stories in the pages that follow show there is no limit to their horizons, to their plans, to their careers. From product design to process design, from coding to devices, from stimulating jobs to equally exciting entrepreneurial initiatives—the world is theirs to shape.

More than ever, engineering is the most direct and successful tool for improving the world and the most effective platform from which to launch graduate and professional studies to further one's education in engineering or the sciences, medicine, business or law. High school seniors and their counselors know it. It is not surprising that the popularity of engineering is on the rise nationally. Its growth has been nothing short of dramatic at Penn, where Penn Engineering is now the most selective undergraduate school. The appeal of our bachelor's, master's and doctoral degrees is at an all-time high. Students from other Penn schools flock to our beautiful buildings to enroll in stimulating classes. Their own interests are what allow us to fulfill our obligation

to enrich the education of non-engineers at Penn and to help educate the public about technology.

On June 30, 2015, I will complete my 17-year tenure as Dean. I am delighted to be writing my last letter to you at such a wonderful moment. In addition to the phenomenal growth mentioned above, these years have seen a major generational change in our faculty. Our departments have recruited exceptionally talented and charismatic professors, who in turn have developed exciting new courses and curricula. Philadelphia and the entire Penn campus have become powerful strategic resources for Penn Engineering. I have been privileged to occupy this job during a rising tide and I have enjoyed watching our progress from the very best vantage point.

We are celebrating the appointment of Vijay Kumar, one of our most respected and beloved faculty members, as our next Dean. His contributions to Penn Engineering are already legend. You will learn more about Vijay in this issue and hear from him soon.

The future could not look any better! ☺

Penn Names Vijay Kumar as Next Dean



Penn Engineering has taken immense strides under Dean Eduardo D. Glandt's leadership. Stunning, award-winning new facilities, premier degree programs and outstanding new faculty have our School poised to achieve even greater distinction among top-tier engineering institutions. During the last eight months, the University conducted a rigorous international search to find Eduardo's successor. We looked for an exceptional academic, thought leader and a participant on the international stage. It is my great pleasure to announce that Vijay Kumar will take the reins as the next Nemirovsky Family Dean, effective July 1, 2015.

President Amy Gutmann has said Vijay's "superb academic judgment, compelling vision for the future of engineering and applied science, and proven track record as a leader and administrator make him the perfect choice to lead Penn Engineering." He is currently the UPS Foundation Professor in the Department of Mechanical Engineering and Applied Mechanics (MEAM). His previous leadership positions at Penn Engineering include GRASP Lab director, deputy dean for both research and education, and chair of MEAM. He also spent a scholarly leave as White House Assistant Director for Robotics and Cyber Physical Systems in the Office of Science and Technology Policy.

Vijay is a member of the National Academy of Engineering and is the recipient of the NSF Presidential Young Investigator Award, Penn's Lindback Award, the Heilmeier Award for Excellence in Research and the Engelberger Robotics Award. Vijay's 2012 TED Talk, "Robots that fly ... and cooperate," is one of Bill Gates' "13 Favorite TED Talks."

On behalf of Penn Engineering and the University, I would like to extend my gratitude for Eduardo's 17 years of distinguished service as dean. His passion for engineering and Penn will be greatly missed! I also welcome Vijay to his new role. I know his energy, enthusiasm and belief in innovation will elevate the School to new heights, and I look forward to working with him for years to come.

Andy Rachleff, Trustee, University of Pennsylvania, and Chair, Board of Overseers, Penn Engineering

Makers & Learners

A New Generation of Product Innovators

By Amy Biemiller

Not long ago, a group of children participating in a workshop at Philadelphia's Franklin Institute developed electrical circuits and engaged in design thinking and engineering. Of course, they didn't know they were learning. They were just having fun with Cirkits, a new product created by two Penn graduate students, one undergraduate and two interdisciplinary researchers in Penn's Integrated Product Design (IPD) master's program.

"It was absolutely inspiring to see the looks on children's faces when they completed the Cirkits cards—they were so excited to show their work to their friends and family," says Celia Lewis, IPD master's student and one of the innovators behind the product.

Cirkits is a sewable electronics kit complete with conductive thread, plastic sewing needles, batteries, sewable LEDs, motors and tiny microcontrollers. Adults of a certain age will remember cardboard stitch cards



designed to help children learn hand-eye coordination by stitching a long piece of yarn through holes punched around a colorful printed image. Cirkits takes this concept to a higher level, combining colorful circus animal cutouts with hands-on electronic engineering components, allowing children to bring their circus to life.

Combining Educational Forces

But before Cirkits was invented, five talented innovators had to team up within the IPD program. The program features a master's curriculum that combines courses from Penn Engineering, Penn Design and The Wharton School.

"More than seven years ago we saw the need for an interdisciplinary program that focused on product design," states Mark Yim, professor in Mechanical Engineering and Applied Mechanics and director of the



IPD program. “The process of idea generation is inherently collaborative. That is what makes it particularly difficult for universities which have boundaries between schools of design, business and engineering.”

The IPD master’s program features a learning experience that exposes students to the rigorous, technical and explorative processes in the development of both experiential and theoretical knowledge.

“IPD gives students the opportunity to work on many real-world projects that address concrete problems,” remarks Sarah Rottenberg, lecturer and associate director of IPD. “They learn how to creatively find practical answers in constrained situations, and learn to do so in a collaborative, interdisciplinary setting.”

An Innovative Sphere of Influence

The opportunity to learn in an interdisciplinary environment is what inspired Lewis to apply to the program, while Taylor Caputo wanted to expand her knowledge beyond fine arts and into product design. Choosing IPD allowed the two to hone their considerable skills in conceptualization, ideation, human-product interaction, aesthetics, manufacturing, marketing and business planning. “I love to learn through doing, and IPD was perfect for that,” says Lewis.

The IPD program is also where the two graduate students and one undergraduate communications major, Amanda Suarez, met Orkan Telhan and Yasmin Kafai, both of whom spent many years at the MIT



Celia Lewis, the design-strategist, and Taylor Caputo, the design-maker, collaborate to create a children's craft kit using electrical circuits.

Media Lab designing methods to combine science, art and technology that result in new ways for people to live, learn and express themselves. Kafai, professor in Learning Sciences at Penn's Graduate School of Education, and Telhan, assistant professor in Fine Arts at Penn Design, teach the IPD's Cultures of Making and Learning class. This is where Lewis was exposed to new and creative technologies, including sewable electronics and the LilyPad Arduino, a small programmable micro-controller board designed for wearables and e-textiles.

"I was really excited about the work we were doing and astounded by the new and different ways designers were working with technology," says Lewis. When an opportunity to do a summer research project around

electronic crafting presented itself, she and Caputo jumped at the chance. The project focused on designing new artifacts that would enhance STEM learning, such as circuit design and programming fundamentals. Their work helped them translate a craft idea into a tangible product that encourages boys and girls to play and learn about electrical engineering.

The Business of Playing and Learning

To bring Cirkits to market, Caputo and Lewis leveraged what they had learned in IPD to tackle the foundational aspects of developing a business. Lewis, Cirkits' design strategist, parlayed her background in business and design into a key role in conducting product research,



Cirkits is a sewable electronics kit complete with conductive thread, plastic sewing needles, batteries, sewable LEDs, motors and tiny microcontrollers.

The kit uses colorful circus animal cutouts with hands-on electronic engineering components, allowing children to bring their circus to life.

evaluating product performance and working with users to understand their needs. “The insights from this work helped us shape what our product looked like and how it functioned,” she says.

Caputo, Cirkits’ designer, used her newfound knowledge in engineering and technical design skills to develop the Cirkits product and supported those design concepts with a greater entrepreneurial sense. “IPD gave me a stronger understanding of business and helped me make the design for Cirkits viable and profitable from a business standpoint,” she notes. “Because of the basics I learned in these classes, I was able to draft a marketing strategy, build a cost analysis and manage the project. My IPD studio classes have definitely influenced the user-testing aspect of Cirkits, and I have used these design research skills when testing our product with children and then iterating on the many prototypes we made for the project.”

Kafai oversees and guides the educational design aspects for Cirkits, while Telhan manages design and engineering decision making. “Taylor and Celia make up a good team: a design-maker and a design-strategist,” says Telhan. “Together they exhibit a unique profile because they can think of design at multiple scales, from prototyping technical details to conducting usability tests and designing a product that is ready for medium-scale fabrication.”

The product launched its first funding initiative in January with a Kickstarter campaign, which quickly earned Kickstarter Staff Pick status. “This was our first time using crowdsourcing as a model to partially fund and disseminate our research,” explains Telhan.

“My biggest hope for Cirkits is that it becomes the launch pad for a series of educational materials that combine crafts and technology, both high- and low-tech designs for learning,” adds Kafai.

Multitasking Entrepreneurship

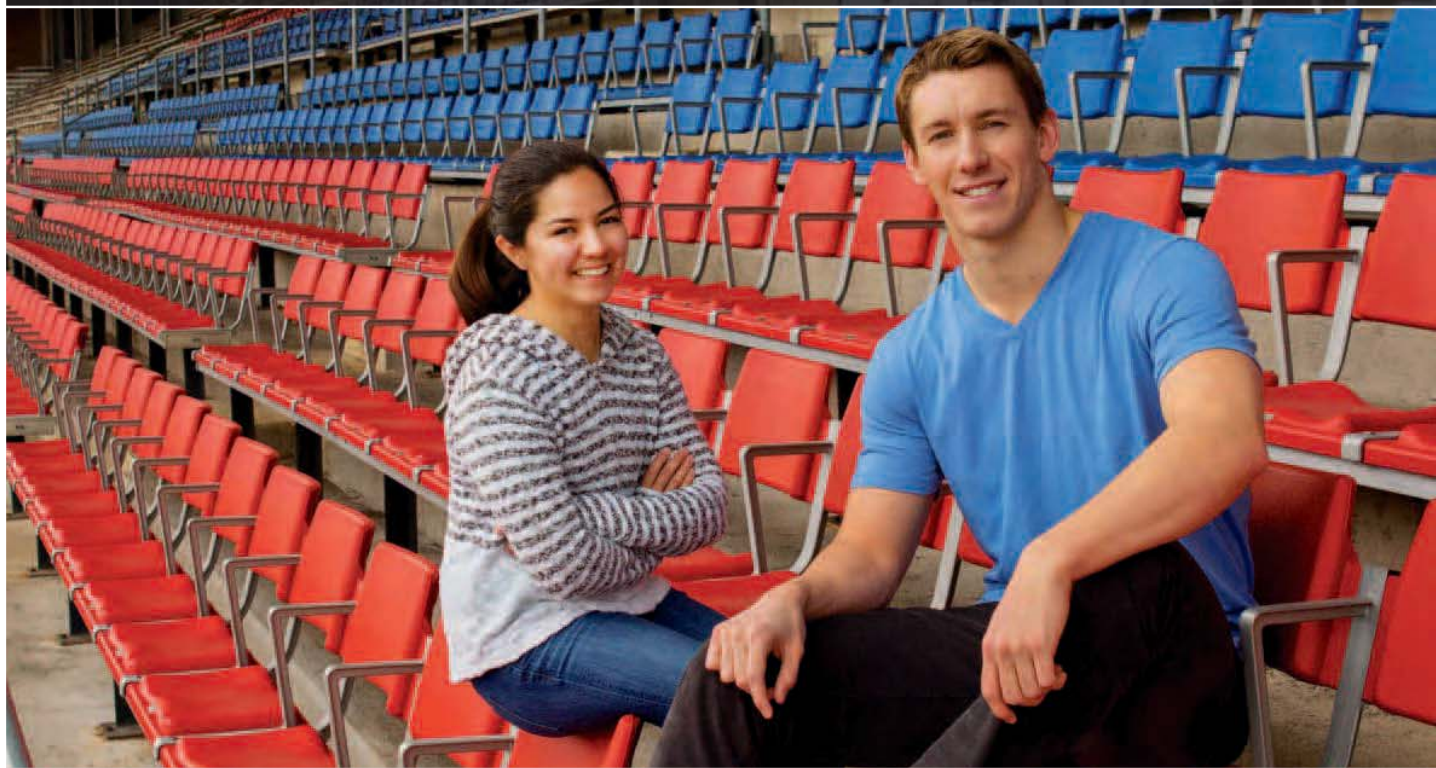
Along with developing the Cirkits product and business model, Lewis and Caputo are partnering on their IPD thesis, developing a product similar to Cirkits. “We’ve been researching different kinds of fabrication processes and discovered that most people don’t know how many of the objects around us are made,” explains Lewis. “We’re seeking to address this gap by designing manufacturing kits that teach children about different kinds of processes— injection molding, extrusion, die cutting and more.”

In the same way that Cirkits is an intersection of design, strategy and innovation, so too is the duo’s new project. “We’re very proud of how we’ve translated various pieces of research and thought into a tangible product. Now we are pushing further to inspire children to become makers,” says Caputo. ☺



From Kicks to Kinematics

Penn Engineering's Scholar-Athletes



Erica Higa and Eric Schultz, relaxing in the stands at Penn's Franklin Field.

When considering the University of Pennsylvania's School of Engineering and Applied Science, prospective students may picture themselves engaging in a rigorous curriculum that equals countless hours of study and dedication to adhere to a standard of excellence.

And they would be right. Some might find the idea of also participating in University athletics much

too daunting. But for scholar-athletes like Penn Engineering's Eric Schultz and Erica Higa, a day that starts in the weight room and ends in the lab is not only routine; they wouldn't have it any other way.

Participation in both scholarship and sport enhances the Penn experience in myriad ways—read on to see Eric and Erica in action.



Eric Schultz: Power Sprint to Success

During the adrenaline-fueled seconds of a race, competitive swimmer Eric Schultz focuses on just one goal: the fun of beating the guy one lane over.

“All I’m thinking about is touching the (timer) pad before the guy next to me,” says Schultz, Penn swim team co-captain and a junior in Chemical and Biomolecular Engineering. One lane over is all that’s visible during a race except when he’s in the lead. He’s had that satisfaction many times over. Schultz currently holds three Penn swim team record times for the 50-yard, 100-yard and 200-yard freestyle races.

Speed and size are obvious factors in his racing victories. At 6’2” and 190 pounds, Schultz’s strength, stamina and

graceful, efficient form allow him to swim visibly high in the water, minimizing resistance with a continuous burst of power.

“Eric’s real strength, though, is his mental toughness,” says Mike Schnur, Penn’s head swim coach. In-season, the team spends 20 hours a week working out in the pool and weight room; some pool sessions begin at 6:30 a.m. “His work ethic is impeccable. He shows the rest of the team how to prioritize schoolwork first, swimming second and everything else a very distant third. What Eric does really well is compartmentalize. When he swims, he swims. When he studies, he studies. Coaching him is fun. You see the rewards on a daily basis, great payoffs from putting in everything he has all the time.”

In February, Eric Schultz helped lead his team to a fourth-place finish at the Men's Ivy League Championships with a win in the 200-yard freestyle and second place finish times in the 50-yard and 100-yard freestyle that qualified him to compete in the NCAA Championships in March.

Appropriately enough, Schultz's favorite class so far, Fluid Mechanics, covers relevant equations for fluids at rest and in motion, buoyancy, friction and energy. His professor for that course, senior lecturer Sean Holleran, also taught classes Schultz took in Material Balances and Thermodynamics in his freshman and sophomore years, respectively. "He's a really responsible guy," says Holleran. "Being able to handle the rigors of the engineering undergraduate curriculum and an equally rigorous sport requires you to be very strategic about time management. It's like having two bosses. Eric deserves a lot of credit for juggling more than one difficult thing at a time."

Not for the Faint of Heart

Schultz says finding that balance was challenging at first. "School wasn't terribly difficult for me from kindergarten through 12th grade. My freshman year at Penn was a big adjustment. I seemed to stress over everything, every homework set and exam. If an exam didn't go my way, I would be down in the dumps for weeks," he recalls. "That wasn't healthy for me. And it didn't work. Last year I tried to change and became more positive. If I did well on an exam, I did well. If I did poorly, then I would just get back up and work hard again the next time. That mindset shift helped my grades and also helped me stay healthier mentally and physically."

"Being a student athlete is not for the faint of heart," says assistant swim coach Marc Christian. "As coaches, we help guide members of our team to manage the highs and lows in the pool and the classroom. We really believe you can pursue excellence in both."

Academically, Schultz is most interested in courses relevant to the oil and gas industry, and is eager to learn more applied skills in his senior design course. Yet he also enjoys the flexibility he's had to take at least one elective course outside engineering every semester. Highlights include a Forensic Mental Health course in the School of Nursing and a course in Japanese Popular Culture that appealed to him because he took Japanese language courses in middle school.

"Engineering is very math-oriented and theoretical analysis-based. So I usually experience the mindset that there's a problem and there's a solution. These other classes feel more open," Schultz says, recalling a cinema class where students discussed why a director chose to cut scenes at specific moments. "There's more than one answer to something like that. Whereas if you need to determine the amount of force needed to push a block up a slippery slope, there's only one solution to that. It's nice to get beyond the formula problems and branch out."

Determination and Drive

During his senior year, Schultz also hopes to take a course in the Music department to refresh his skills playing tenor saxophone and to explore his favorite style of music, jazz. While his love of swimming began at age six, Schultz says he expects to change sports after graduating, perhaps to tennis, because his favorite aspects of swimming, keen competition and teamwork, would be nearly impossible to replicate when he's working full time.

Schultz has applied the diligence that served him well in the classroom and on the swim team to his career launch. The summer before his junior year, Schultz worked at a Philadelphia startup, Near-Miss Management, co-founded by Penn alumni, where he sold risk management software to refineries. This summer, he has a position at a Dow Chemical Company manufacturing site, an experience he hopes will clarify his career goals.

"Swimming teaches me time management, how to stay calm and use adrenaline to my advantage," Schultz says. Given his determination, drive and engineering competence, it's easy to envision future successes for Schultz far beyond the warm, bright realm of a natatorium.

By Jessica Stein Diamond

For Erica Higa, what remains constant and familiar are the 60 x 100 yards that comprise a soccer field—turf she’s had under her feet since she began playing the game at the age of eight.

Erica Higa: At Home on the Field

One might expect a trace of homesickness to surface during a conversation with a Penn freshman far from her family and friends on the West Coast. Not so with Penn Engineering’s Erica Higa, a central midfielder for the Quaker women’s soccer squad. While a testament to her independent spirit, Higa’s self-confidence also speaks volumes about the manifold positive effects of team sports on the University’s student athletes.

For Higa, what remains constant and familiar on either coast (and anywhere in between) are the 60 x 100 yards that comprise a soccer field—turf she’s had under her feet since she began playing the game at the age of eight. Her home is where her team is.

Surprisingly, there is no evidence of culture shock, given that home for Higa is a farm in bucolic Northern California. East Coast vs. West Coast stereotypes aside, Higa concedes that Penn’s lively urban campus is different from the more mellow suburban life she is used to, but “different in a good way.”

Higa grew up with close to 100 small animals in her backyard, where the menagerie (goats, pigs and rabbits) is the main attraction for Animal Assisted Happiness (AAH), a non-profit, volunteer-driven organization founded by Higa’s parents. AAH welcomes children with special needs and their families to the Higas’ “destination sanctuary,” where the visiting children’s physical and emotional challenges are bested by the joys that interaction and bonding with animals can bring.

A Force on the Pitch

Inspired by her father, who played soccer in college and an older brother who played the game in a club league, Higa was a force to contend with on the pitch by the time she reached high school. Her coach noted that even as a freshman, Higa’s “technical ability and understanding of the game was clearly of a higher level than anyone else on the field.”

Along with her high school team, Higa played for Mountain View Los Altos (MVLA), a member club of the Elite Clubs National League (ECNL). ECNL coach Erin Montoya described Higa as a “silent leader,” who helped both teams to championships. It was at the ECNL showcase games where Higa caught the eye of several college coaches. Penn scouts were among the impressed, especially when it became known that Higa’s athletic prowess was matched by her academic acuity.

It had not been all soccer play and no work for Higa throughout high school—her unweighted GPA was 4.0, with AP courses in Calculus, Physics and Japanese. She received the Scholar Athlete Award in 2011 and 2013, founded the AAH club at her school, and was the string orchestra’s viola co-section leader.

It was then Penn’s turn to impress Higa. It took one visit to campus with a weekend stay hosted by members of the women’s soccer team for her to become convinced. She felt the fit was right, and importantly, that her skills would be of value to the University.

Following Her Father’s Footsteps

Along with her love of sports, Higa shares her “mathy” abilities with her father as well. Mr. Higa, having studied engineering in college, encouraged her to do the same. Once recruited by Penn, Higa’s choice of a school was clear: it would be the School of Engineering and Applied Science. Undaunted by the rigorous engineering course loads and substantial time demands in addition to her athletics commitments, she applied early decision and was accepted.

Like nearly 20 percent of all Penn Engineering freshmen, Higa began her coursework without declaring a major; she was curriculum deferred. Gravitating toward Mechanical Engineering and Applied Mechanics (MEAM), she enrolled in the hands-on, project-based MEAM 101 to gauge her interest. The course was just



what she'd hoped for and her mind is all but made up. She describes herself on her resume as "aspiring toward a bachelor's in Mechanical Engineering and Applied Mechanics."

Though sidelined briefly by an ankle injury sustained during her last days playing for the MVLA Mercury Black team last summer, Higa was still able to show Penn what she was capable of as a freshman starter in the fall. She has a high regard for her coaches, who looked closely at her speed and skill while overlooking her smaller-than-average 5-foot frame. She also has

great praise for her teammates, who gave her strong support and encouragement as a first-year player.

The closeness and camaraderie of the women's soccer team, in fact, imbues her entire Penn experience, and she thinks of her teammates as one might think of family members. In fact, as she looks toward leaving Philadelphia for her upcoming summer engineering internship at Arista Networks in Santa Clara, California, she anticipates that she might be a bit, well...homesick.

By Patricia Hutchings



From left: Jordan Reed, Professor David F. Meaney and Taylor Concannon



Turning the Tables

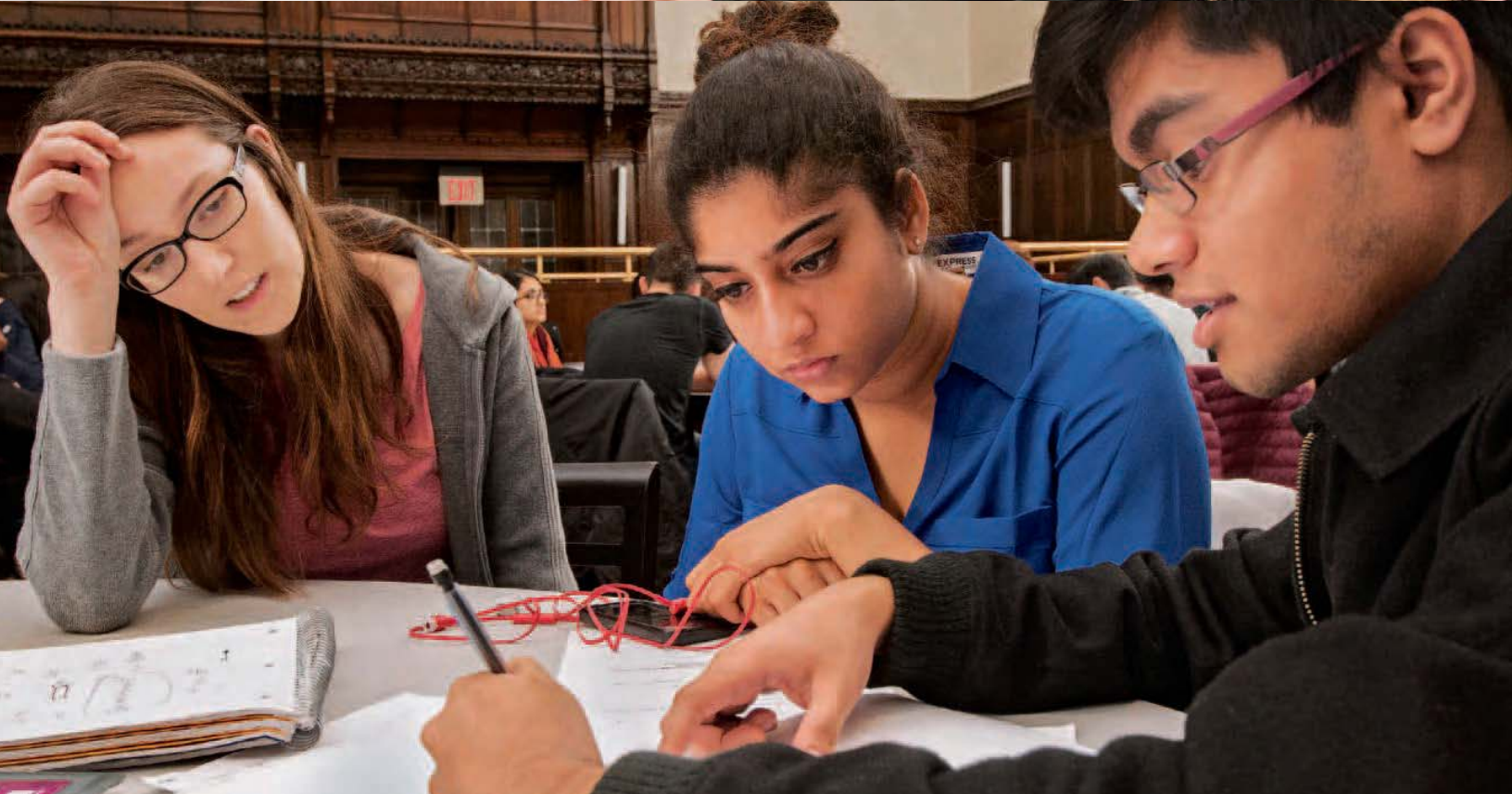
The “Flipped” Classroom Promotes Deeper Learning

By Stephanie Sayago Bell

How does one learn to “think like an engineer?”

While today’s students may not be able to name their preferred learning styles, savvy professors understand the value of a curriculum that appeals to different types of learners. David Meaney, Solomon R. Pollack Professor and chair of Bioengineering (BE), and LeAnn Dourte, lecturer in BE, undertook the task of redesigning BE 200, Introduction to Biomechanics, in order to deepen the learning and thinking experiences

of sophomore students enrolled in this required course. With added input from Teaching Assistant (TA) and doctoral candidate Sarah Rooney, BE 200 was reworked to reflect and incorporate the most innovative approach to education: a unique version of the inverted classroom. “SAIL,” an acronym standing for Structured, Active, In-class Learning, is a classroom style developed by Penn’s Center for Teaching and Learning. SAIL provided the inspiration and framework for this new endeavor.



Top from left: Alec Stablow, Lecturer LeAnn Dourte and Karyll Davis; Bottom from left: Margaret Nolan, Mounika Burugupalli and Parag Bapna

Engage All Learners

The inverted classroom is one of the freshest ideas in education, and is a result of research that supports the theory that students learn more, and are more successful, when they are actively engaged in processing their own learning. While past iterations of this course were taught in a traditional lecture and recitation format, Dourte, the primary instructor for the course, searched for a better way to engage all learners. Under this new structure, students are no longer passive receivers of information, but dynamic participants in strategically designed class activities.

“Students at this level are still figuring out their best way to learn,” Dourte says, “and this is their first true engineering course, so it made sense to target this class for the redesign.” Enthusiastically supported by Meaney, Dourte set out to fine-tune BE 200. While the course content has not changed, the content delivery method has. Many of the class sessions now focus on specific problem-solving activities. Both Dourte and Meaney, as well as Rooney and a second TA, doctoral candidate David Gabrieli, circulate during class to advise students on strategies and group interaction.

Real-world Problems

The instructors design assignments for the course to challenge students to “tackle problems more globally and think like engineers in the real world,” Dourte states. Rather than a lecture-style setup, students now work in groups of three to solve problems developed by the team of instructors. On a practical level in the real world, engineers have to simplify word problems into solvable mathematical equations. The team ensures that the problems presented in class reflect this component, and also presents a second challenge: students are asked to suggest next steps that an engineer might undertake in each scenario. Students need not only excellent math and physics skills, but also need to think creatively and work together as part of a team.

A Group Dynamic

The SAIL approach enables instructors to cover all course content, with the added bonus of addressing additional skills that may not have been at the forefront

previously: specific problem-solving strategies and group dynamics. Understanding how to work as part of a team of professionals and learning to respect and trust teammates, as well as their mentors, are life skills students will utilize throughout their academic and professional lives. Learning continues outside of class as well. Homework may consist of watching a video or PowerPoint presentation designed to enhance in-class work.

For the group problem-solving activities, students are presented with an outline they complete together. Meaney explains that, “the outline presents the problem, but intentionally does not include all possible information.” For example, students might be looking at a problem of bone failure, without the information regarding the way in which the bone failed. Students are expected to rely upon their immediate group partners, but as Meaney points out, one of the most satisfying moments for the instructors was watching as the group dynamics evolved to include interaction with other groups. Not only do students learn course content, they learn the value of team skills as well.

Hands-on Approach

William Yang, BE’17, a student in the course, explains the different types of scenarios students face. He says that since this course is an introduction to materials science, Dourte uses concrete examples to enhance understanding of the concepts students must master. For example, she might give each group an elastic band and ask students to manipulate the object and observe its properties. Yang cites the interaction among group members as an especially effective learning strategy. “Hearing another perspective helps me to better understand the material and also helps me to learn. You have to ‘do’ science and ‘see’ science to really learn it,” Yang says.

Dourte says it is not just the knowledge of content that is crucial to the futures of her students, but understanding how each best learns and works that will contribute to their future successes, no matter what paths these engineers choose beyond Penn. Whether they pursue medical degrees, law degrees, graduate work in engineering or employment, they are acquiring the expertise that allows them to “think like engineers.” 🍷

Next-generation Engineer

Venmo Founder Iqram Magdon-Ismail Creates More Than Tech

By Jessica Stein Diamond

Imagine a world in which celebrity engineers are as visible in the pop culture firmament as star chefs and actors. Sound far-fetched? Consider the irrepressibly fun and creative Iqram Magdon-Ismail, ENG'05, for whom such fame may be within the realm of possibility.

Ikram co-founded Venmo, a mobile phone application to share payments via texts, in 2009. After the firm posted meteoric customer growth, especially among people in their 20s and 30s, Venmo processed \$2.4 billion in transactions in 2014. Iqram is also lead guitarist, lyricist and composer for his eponymous global music band, which performed in February at World Cafe Live at Penn. The band's danceable sound evokes early Vampire Weekend recordings and Paul Simon's Afro-pop collaborations.

As for which career becomes his sideline, mobile payment guru or musician, only time will tell. Iqram is a fount of tempting startup ideas and catchy tunes. Venmo dominates for now. The business was purchased just a few months post-launch in 2011 for \$26.2 million by Braintree, a firm that was subsequently purchased by PayPal, a public company, in 2013. Braintree powers payment processing for many popular mobile apps, including Airbnb, Uber and LivingSocial.

“Venmo Me”

“People like to scroll the Venmo feed to see what their friends are up to and what they're thinking,” says Iqram, describing how people read text messages in the Venmo feed that appear when people transfer money between cellphones. “We're in an era where we're always trying to keep up with what our friends are doing. There's Facebook, Twitter, and now there's Venmo. Our goal is to make it so people want to pay with Venmo whenever possible because it's easier and interesting.”

Becoming the go-to app for the long-predicted shift toward mainstream use of mobile payments is a pretty good gig: in addition to Venmo, other firms like Google Wallet and Square Cash are keen to get in on the action. Americans are expected to spend \$90 billion on mobile payments in 2017, according to a 2013 Forrester Research study (which also reported \$12.8 billion in mobile spending for 2012). Among those who increasingly use Venmo for gifts, tips, rent and splitting costs, for instance, after a restaurant meal, it has become a verb. “Venmo me” is shorthand for, “Don't forget to



Iqram Magdon-Ismail

pay me back, dude.” When you’re lucky, you hear the alternate meaning for Venmo as a verb: “I’ll Venmo this,” which means, “my treat.”

The ‘aha’ moment that inspired Venmo occurred one weekend in 2009 when Iqram visited his former Penn roommate and co-founder, Andrew Kortina, SAS’05, in Manhattan. “I left my wallet in Philly but I had my phone. He ended up paying for the entire weekend—drinks, dancing, going out, having lunches and breakfast,” recalls Iqram. “Then I had to repay him. That’s when it struck us. We realized, ‘We both have our phones. We should be able to send each other money right now.’” Veterans of several near-miss startups they attempted to launch together during their first few post-graduate years, they were eager to try again.

Fun-loving Oddballs

Today, Venmo provides entirely free person-to-person payments via debit cards and bank accounts, and has an ambitious plan to become the preferred payment method for merchant processing (a fee-based service) as well. The firm has 90 employees, whom its website describes as “a group of fun-loving oddballs.”

This year Iqram also plans to become the first Penn Engineering alumnus ever to make a charitable donation to the School using a payment system that he invented. “We hope that will get the charitable contributions ball rolling,” says Iqram, whose name means “generosity” in Arabic. After brainstorming for years about the least annoying way Venmo could support philanthropy, in 2014 the firm began allowing customers to opt into supporting charities during the cash-out process—when funds received via texts are transferred into a customer’s bank account. Venmo’s initial options to support Malaria No More and the American Heart Association during cash-outs have raised funds successfully. Fee-free donation services will likewise be available for other interested nonprofits.

Music, moxie and multiculturalism are key themes in Iqram’s life; each is apparent as he performs with his band wearing a red shirt unbuttoned well below

a typical engineer’s aesthetic, dances exuberantly on stage, and urges the crowd to clap in uniquely African rhythm patterns. His last name, Magdon-Ismail, reflects his family’s Sri Lankan roots, though he grew up in Zimbabwe, Zambia and Uganda, where music was very much a part of daily life. Iqram’s family moved to Virginia when he was 14 so he could be educated in the United States, following the lead of his brother, Malik, who traveled from Zimbabwe solo to attend Yale University and later obtained a Ph.D. from Caltech. Malik is now a professor of Computer Science at Rensselaer Polytechnic Institute.

Mind-twisting Experience

At Penn, Iqram majored in computer science and minored in theater. He describes his first-ever computer science courses at Penn as a “mind-twisting” experience with 24/7 programming challenges. “I could feel my mind expand. It felt like I was becoming smarter,” he recalls. Iqram remains in touch with Thomas A.V. Cassel, Professor of Practice in Engineering Entrepreneurship, whose course influenced Iqram’s career trajectory. “He taught me how to raise money, put a pitch together, and handle the ups and downs of a business launch, all of which gave me the confidence to do my own thing professionally.”

Surprisingly, minoring in theater has been “incredibly helpful because I use that balance between computer science and my creative background on a daily basis,” says Iqram. Theater strengthened his ability to communicate and listen effectively, core skills for investor pitches, and exposed him to vocal exercises he frequently uses to preserve his voice.

“Most of all, what I learned from theater was how to be courageous, comfortable with who I am, and to not let people distract me from what I believe in,” says Iqram. “When you’re starting a company like Venmo, that training can come in handy because in the early phases you’re presenting something new to people who tend to shy away from it. You have to be very persistent in your message and vision.” ☺

Iqrammusic.com—recommended tracks: Big City (Live) and Angel.

First Jobs

Engineers Reveal Post-Penn Paths

By Catherine Arnold

For Penn Engineering's recent and soon-to-be graduates, time has moved swiftly since Engineering Career Day hosted 104 employers and 1,597 undergraduate and graduate student and alumni participants last fall.

Several career fairs take place throughout each school year on the Penn campus, notes Rosette Pyne, senior associate director of Career Services, including the Start-Up Fair, with 80 companies and the Spring Career Fair, in which companies seek students for full-time and internship opportunities. Many students attend off-campus fairs as well, such as the All Ivy Environmental Career Fair hosted at Columbia University in the spring.

There's a hearty welcome for Penn Engineering graduates regardless of the location. "They are among the very best prepared in the country, and employers across all industries are competing to recruit them because of their proven educational, research and work accomplishments," points out Pyne.

In the pages that follow, six Penn Engineering students discuss their Penn preparation, the job search and their post-Penn plans in a variety of fields and positions.



Sandhya Thiyagarajan

Production Engineer

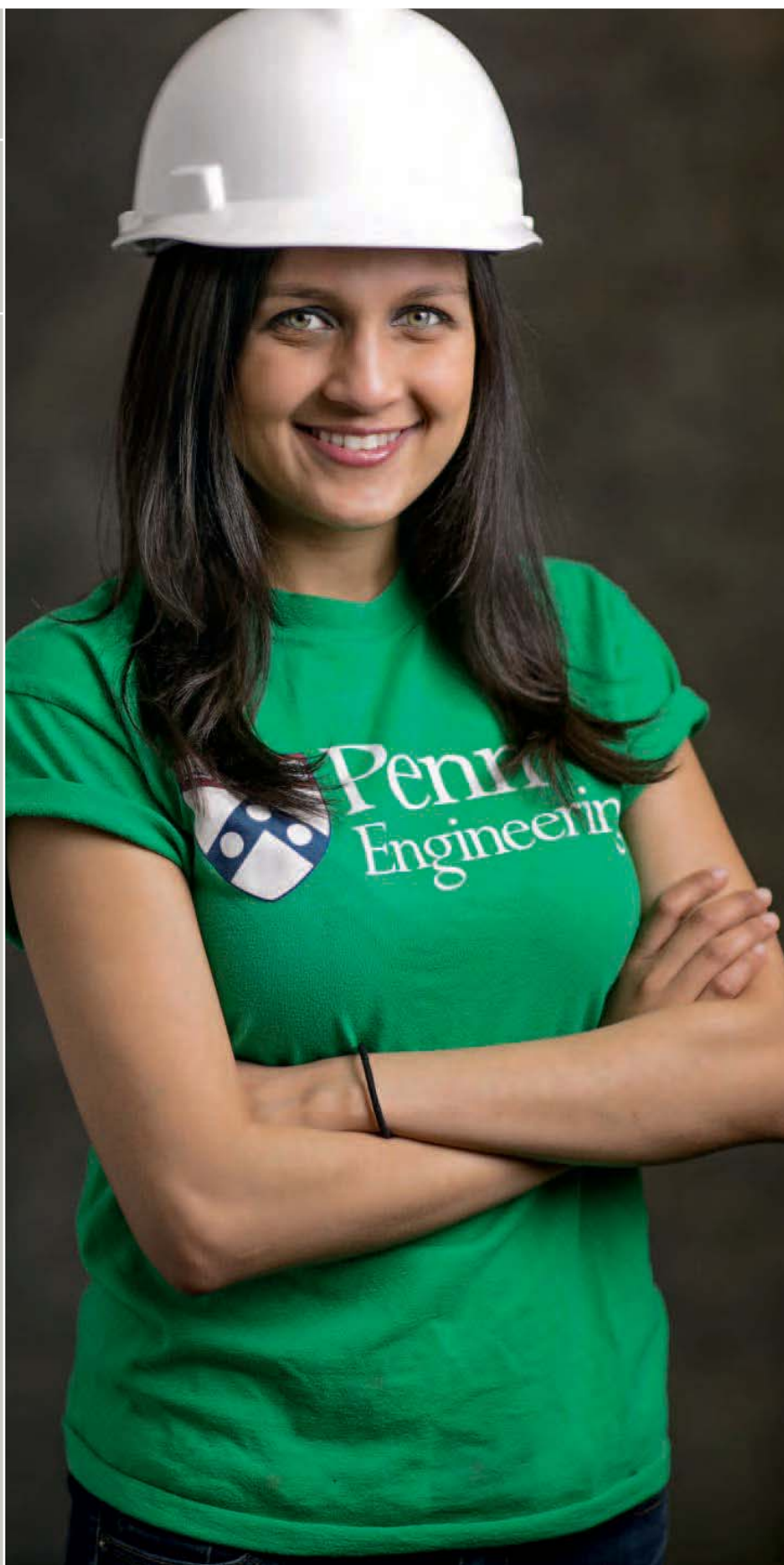
Dow Chemical Company

“My new job will be very hands-on,” says Sandhya Thiyagarajan, CBE’15. Her position as a production engineer at Dow Chemical Company in Newark, Delaware, begins in July. “Some of my time will be spent at a desk doing design work, and I’ll also be in the plant seeing designs being fabricated and doing quality checks. It will be exciting to see my work being created.”

Penn Engineering’s curriculum and focus on teamwork were crucial for her, states Thiyagarajan. “Within chemical engineering, the curriculum is so rigorous that you’re usually working within a group. It’s the same in a job—you bounce ideas off of others. Learning this was an important takeaway for me.” Being able to apply higher-level coursework will also be satisfying. “I took several advanced classes in my junior year, and was worried that I wouldn’t use what I learned. That certainly won’t be the case,” she notes.

For her job search, Thiyagarajan went through the Penn recruiting process and attended the Penn Engineering Career Fair. “I was able to meet a lot of great companies, and it eventually led to my full-time job,” she states. In addition to attending the career fair, she also went to a few regional career conferences for engineering groups like SASE and AIChE to expand her network.

To define a career goal, Thiyagarajan recommends doing as many internships as possible. “Keep in mind that an internship is only one summer, so if you can have a lot of different experiences you will have a better idea of what you want to do,” she advises. “And if you find yourself in an internship that is not right for you, learn as much as you can and use that experience to land your dream job.”



Abhishek Gadiraju

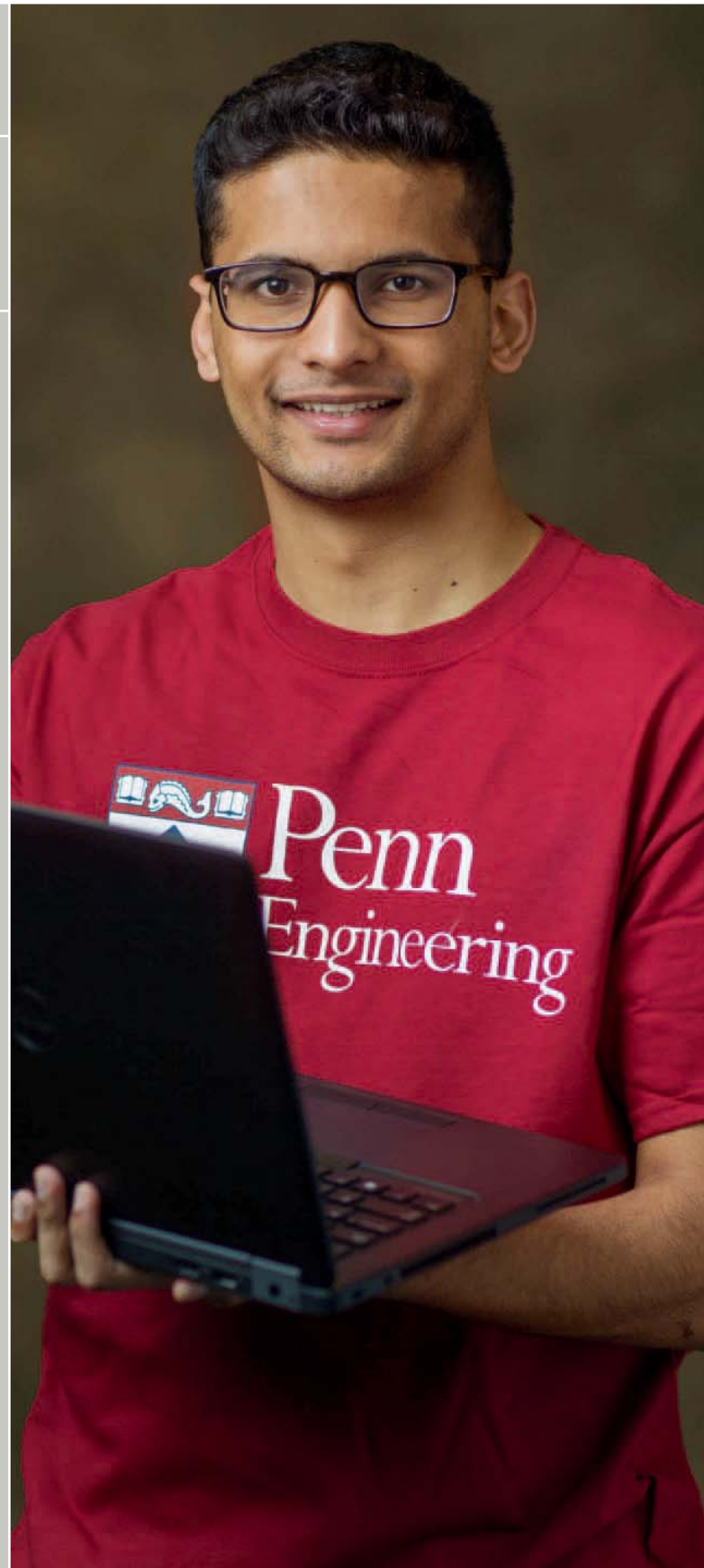
Software Engineer

Flatiron Health

Abhishek Gadiraju, NETS'15, with a minor in Engineering Entrepreneurship, will begin his engineering career with Flatiron Health, a New York City-based healthcare software company. Currently the only general statistics available to doctors about drug performance are found in clinical trial data and industry reports. As a software engineer on the Flatiron team, Gadiraju will build out secure and robust pipelines to help doctors see across these boundaries and better analyze their patient base.

Gadiraju is a member of the first graduating class of Penn Engineering's Networked & Social Systems Engineering (NETS) program. Early on, he used Career Services resources to find alumni working in industry and began "cold" emailing individuals who seemed to share his interests. This experience taught him how to reach out and use the Penn network. He spent summers working at Penn as a research assistant for a machine-learning project, and as an engineering intern at Klout in San Francisco. During his junior year, he met with and got an internship at Flatiron Health after they came to campus for the Startup Career Fair in 2014.

His job-hunt advice for fellow Pennengineers? "The job search experience can be very daunting for underclassmen," notes Gadiraju. "My biggest piece of advice is to never turn down an opportunity to meet someone new, whether it be a prospective employer, another student, or an alum. You never know which doors lead down the 'right' path, so the best thing to do is to open as many doors as possible."





Danielle Fau

New Product Development Engineer
W. L. Gore & Associates

Intensive courses at Penn, a research experience with the Composto Polymer Research Group, and internships and work abroad in Switzerland and other countries meant opportunities, says 2014 MSE bachelor's and master's graduate Danielle Fau. "Taking undergraduate and graduate-level classes that entailed integration across business, engineering and medical disciplines was beneficial to my search for internships and employment."

Along with two international summer work experiences, a semester abroad at ETH Zurich expanded her interests, says Fau.

Like many seniors and recent graduates, Fau networked by attending dinners on campus with returning alumni, participating in Women in Engineering job fairs and working with Penn Career Services. "The staff helped me sort through and reject internship offers that would not have allowed me to follow my career path. I was grateful for their guidance."

Following her interests in helping others led Fau to an internship and further opportunities at W. L. Gore & Associates, Inc., the company that makes Gore-Tex® and medical products and devices. She started as a new product development engineer in late March 2015, in Elkton, Maryland. Fau notes, "I've always had a desire to help people, and wanted to do so through engineering."



Chris Beyer

Software Engineer

Amazon Web Services

In his new position at Amazon Web Services (AWS), Chris Beyer, CMPE'15, will likely write code for one of Amazon's databases or for customer-facing tools intended to improve the user experience.

Landing in software engineering work in Palo Alto, California, for AWS is not a huge surprise for Silicon Valley native Beyer. "I came to Penn knowing I wanted to work in tech, but I didn't know I wanted to pursue computer science until my sophomore year," he says.

Starting at Penn in electrical engineering, Beyer was inspired to switch to computer software studies after taking the required introductory software classes.

Beyer says that his tech job search involved as much time spent online as at job fairs. "I applied with at least 80 companies, and spent a lot of time managing applications." An early offer from Amazon, where Beyer interned last summer on the AWS team, elated him.

A solid foundation at Penn also eased his way into the workforce, he notes. "There are so many intelligent people at such a thriving school, and everyone is doing big things. They are all working hard to solidify their futures, and it fosters an environment where you are highly motivated to succeed."

Shelby Bierig

Systems Engineer

Boeing

The aerospace industry snagged the attention of Shelby Bierig, MEAM'15. After her summer 2014 internship at the Hawthorne, California-based SpaceX, a company that builds rocket engines and handles space transport services, she “had the bug,” she says.

In late summer 2015, Bierig starts at Boeing, a nexus of major aerospace work. She will begin as a systems engineer in a satellite rotation program at the company's El Segundo, California division. She'll likely start in the manufacturing division, and later will have rotations in five departments of the company, including thermal and structures, she notes.

During her job search, Bierig learned quickly that she preferred career fairs to online job searches. During her senior year, Bierig went to Penn career fairs and traveled to various other events. “People respond to you when you're right in front of them and if you're passionate about their company,” points out Bierig. Keeping in direct contact with the companies was easier after that as well.

Studying among other Penn students with a professional mindset made networking natural to her, says Bierig. “I learned how to approach someone and speak to them, subsequently finding out more about what I was good at and what I'd want out of a job,” she notes.



Dandi Zhu

Business Analyst

McKinsey & Company

“I’m the type of person who loves a dynamic environment where I’m working on one project for a few weeks, then being staffed on a completely different study in a different industry and function,” says Dandi Zhu, BE’15, with a minor in Engineering Entrepreneurship. Zhu will start as a business analyst at McKinsey & Company’s Chicago office in late summer 2015, stepping into a generalist management consulting role.

Internships in research at the Children’s Hospital of Philadelphia and as a business technology analyst at J.P. Morgan showed Zhu that she liked research, analysis, and project management, and that she preferred those paired with a fast pace, interactions with people, and projects that make an impact.

The fall of her senior year had its own fast pace, notes Zhu. “I had nearly 20 interviews within two to three weeks in September and October. It was quick, and involved a certain amount of jumping around.”

Consulting will suit Zhu well, she thinks. “I’m looking forward to the amount and frequency of feedback. Every week, we’ll have valuable and constructive one-on-one discussions. I’m interested in improving on my weaknesses and hearing what I’m doing well.”



Leaving a Legacy

Celebrating Bill Hamilton's Tenure at the Helm of M&T

By Manasee Wagh

After 35 years as the influential founding director of the Jerome Fisher Program in Management and Technology (M&T), Bill F. Hamilton, BS CHE'61, MS CHE'64, WHG'64, is stepping down.

Hamilton is the Landau Professor of Management and Technology in the School of Engineering and Applied Science and The Wharton School. Years ago, as a Penn student, Hamilton bucked the usual practice of studying in a single discipline and earned degrees in both engineering and business, believing that marrying his two interests was the best way to foster innovative thinking and expand his career options. He has worked as a research engineer, a director of several companies, and a White House Fellow and Special Assistant to the U.S. Secretary of the Department of Transportation. His energy and experience have helped M&T, Penn's first dual degree offering, blossom into a model-integrated program.

Now that he is stepping down, Hamilton says he plans to stay connected to the M&T program through its many alumni and its executive board. He is especially looking forward to returning for the dedication of the program's renovated and expanded Larry Robbins Building. In the following conversation, Hamilton reflects on his time with the program and its impact on both him and past and future generations of Penn students.

Penn has been in your life since your undergraduate years. How did it shape you?

In too many ways to enumerate, but here are a few: Penn Engineering developed my ability to analyze and solve problems, an invaluable skill throughout my career. Wharton gave me the understanding and perspective to ask the critical "So what?" questions about whatever issues and opportunities arose over the years. Wrestling shaped my work ethic and personal discipline. The collegiality of classmates and fraternity brothers certainly contributed to my personal growth and maturity. Finally, as professor and mentor to thousands of exceptional students, Penn gave me the opportunity to live the oft-cited ideal of "doing what you love and loving what you do."

As the first dual degree program at Penn, M&T was one of a kind. It must have held a special appeal in your eyes.

Had this program been available when I was a Penn Engineering student, I would have jumped at it. Instead, I earned graduate degrees in business and engineering, which my advisors thought was a bad idea, but I had interests in both areas. I started in technology and received a full fellowship for a Ph.D. in engineering, but as I got more exposed to the business world, I realized



Bill Hamilton



the importance of economics as well. So the M&T combination of engineering and business resonated immediately with me. It's a great privilege to introduce students to that integration of knowledge which is so important to innovation in today's society.

You must have had many memorable moments. Are there any that particularly stand out?

The recent M&T 35th anniversary celebration, where more than 200 alums returned to campus, was the highlight of my academic career. It was an extraordinary event; at times it was very emotional and humbling for me as former students shared how much Penn and M&T had influenced their professional and personal lives. They made it very clear in so many ways just how important the past 35 years of the program have been.

With your retirement approaching, what personal achievements over the years come to mind?

I am most proud of the roles I have been privileged to play in the creation and development of new and lasting institutions at my alma mater. In addition to the M&T program, which is at the top of the list, I'm proud of my roles as co-founder of Wharton's Decision Sciences Department (now the Operations and Information Management Department); one of the founders of the Leonard Davis Institute of Health Economics; an initial driving force and advisory board member behind the Weiss Tech House; and member of the founding team of the Emerging Technologies Management Program (now the Mack Institute for Innovation). These organizations are now significant contributors to Penn's vibrant enterprise and will continue long after I'm gone. That's extremely satisfying, as is the legacy of 2,000 M&T alumni whose great energy and abilities will continue to shape our world for the better.

M&T was built to help students navigate the real world of business and engineering. How has it grown and changed?

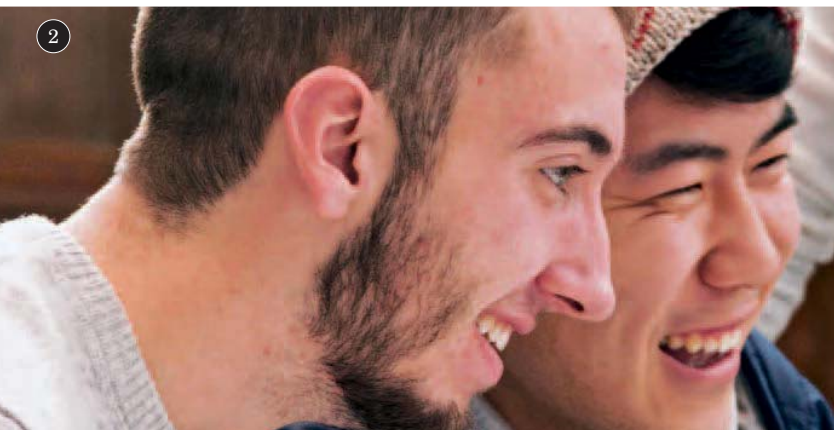
The overall objectives and structure of the program have remained the same in order to encourage and support exceptional students in their pursuit of concurrent degrees in engineering and business with explicit attention to their integration. Within that framework, however, there have been many positive changes, including much greater emphasis on community and cohort development, significantly increased alumni involvement, creation of the M&T Executive Board and greater student access to internship and career guidance opportunities. A major near-term change will be the complete renovation and expansion of the M&T building, to be named the Robbins Building in honor of alumnus Larry Robbins and his major support of this important step forward. I expect to see even greater student-alumni interaction and even more active alumni groups across the United States in the future.

Graduates of the program emerge with a dual skill set. How does that benefit their career paths?

Our students experience particularly challenging curricula and special opportunities. They embark on their careers with unusual confidence, capabilities and credibility. This is clearly evidenced by the degree to which they are sought after in the recruiting process and the range of very attractive options with which they are presented.

What's next for you?

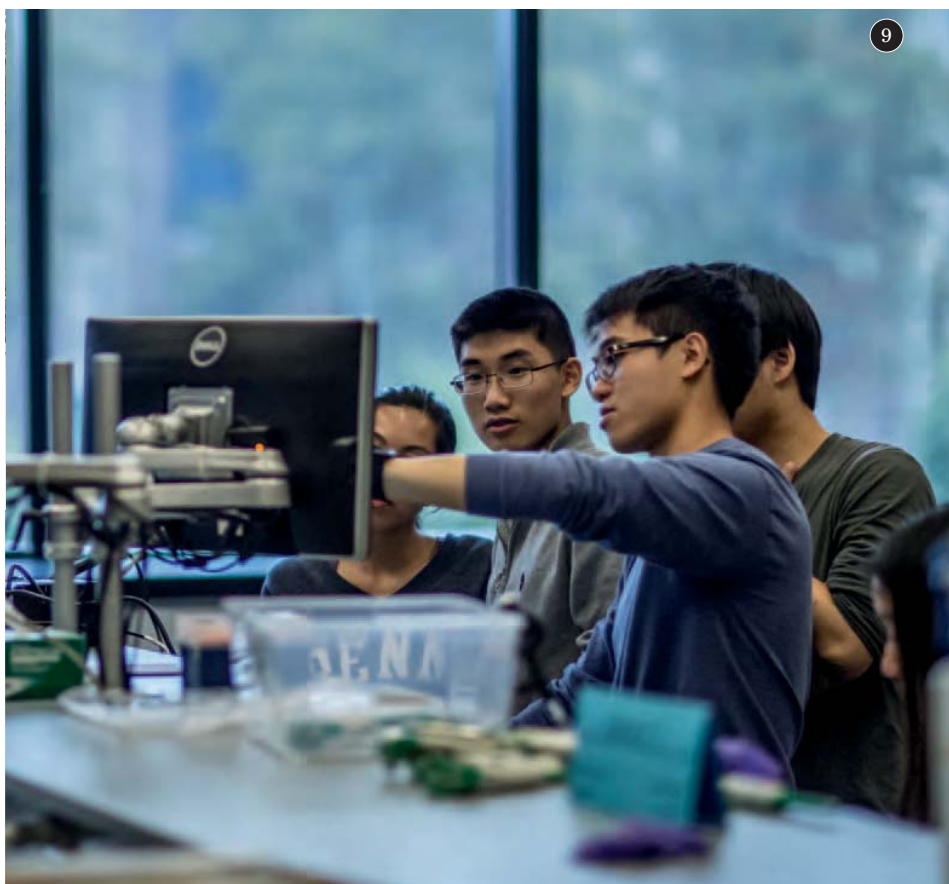
My favorite answer is "everything else." I'm going to do a great deal of "other stuff," but a lot of it starts with sports. I'm an avid tennis player and skier, and I enjoy golf. In the near term, I plan to pull back, decompress, and explore lots of options that I just haven't had the time to pursue in the past. I'm really looking forward to that luxury! 🍷



On Our Camera Roll



1 A carpenter cuts studs for the renovation of Towne's Active Learning Classroom. **2** Students share a light moment in class. **3** Smith Walk's banner highlights PennApps, cited as "the world's longest-running collegiate hackathon" by The New York Times. **4** MEAM Ph.D. student Matt Piccoli assembles a blade for an aerial robot in the GRASP Lab. **5** In the shadow of Levine Hall, students play a quick game of Ping Pong on the Quain Courtyard.



6 Capturing a snowy scene on March 20, 2015, the first day of spring! **7** The Engineering Quad is home to many quiet study spaces. **8** Pipetting samples at the bench in Chemical and Biomolecular Engineering. **9** Bioengineers analyze their drug delivery model to assess pharmacokinetics in the Stephenson Foundation Undergraduate Laboratory. **10** Graduate student Benjamin Charrow acts as referee at the Penn FIRST Lego League championship.



Rakesh Vohra

Using Math to Engineer Social Systems

By Janelle Weaver

In the early hours of September 15, 2008, Lehman Brothers, then one of the nation's largest investment banks, announced that it would file for Chapter 11 bankruptcy protection. As the largest bankruptcy filing in history, this event sent shockwaves through the global markets and had devastating implications. "Interconnectedness of the financial system, some suggested, allowed Lehman's fall to threaten the stability of the entire system," says Rakesh Vohra, George A. Weiss and Lydia Bravo Weiss University Professor in the Departments of Electrical and Systems Engineering (ESE) in Penn Engineering and Economics at Wharton. "This prompted researchers like me to try to characterize the networks that would allow shocks to one part of the financial network to spread and amplify."

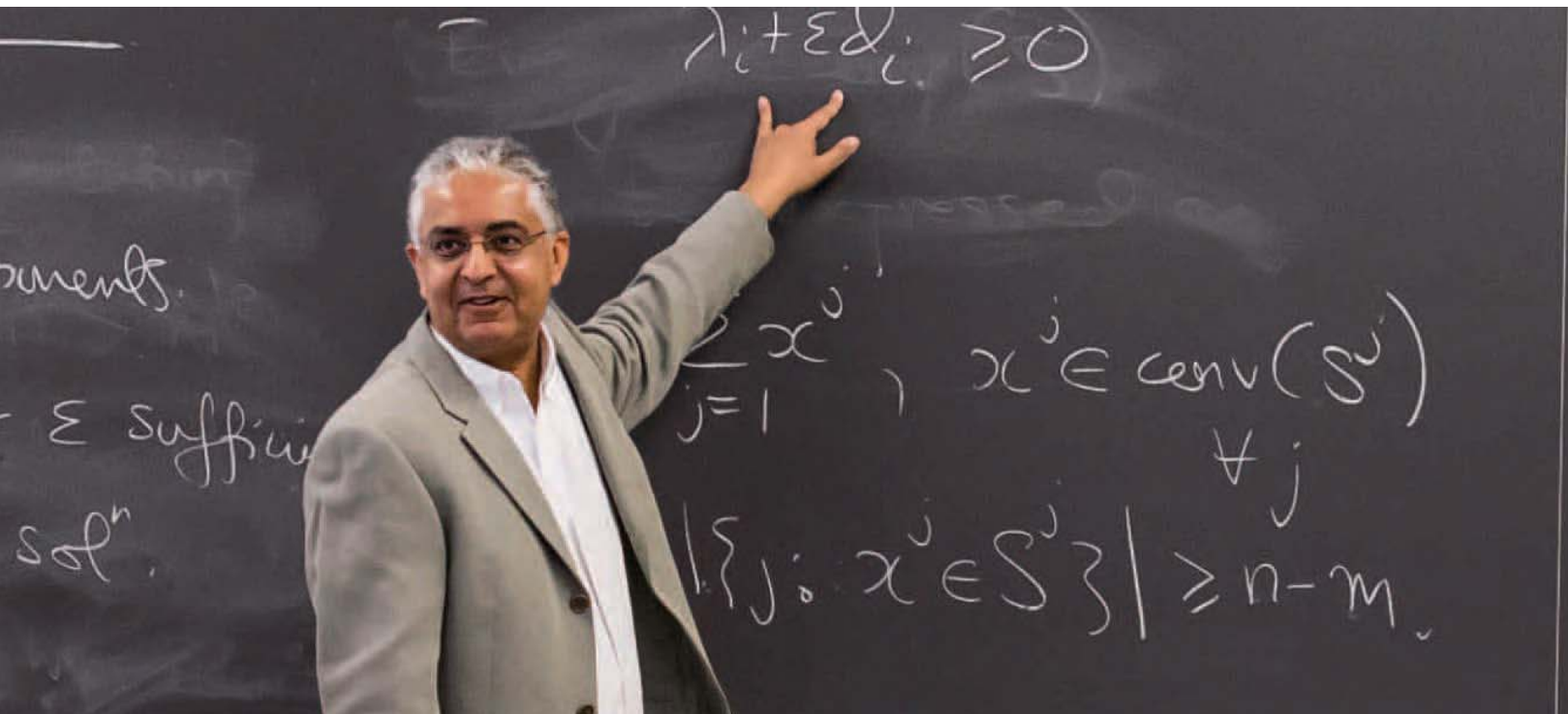
Recognizing the importance of understanding financial networks for shaping effective government policies, Vohra worked with Economics doctoral student Selman Erol to develop a model of network formation and systemic risk. Their findings suggested that safer economies make firms more confident, which naturally makes them take on more risk by becoming more interconnected. But the overall effect is that safer economies become too interconnected and, paradoxically, become more prone to system-wide failures. "In the long term, this work can be complemented by asking whether or

how the government should intervene in the financial network architecture," Erol states. "Unintended welfare consequences at such a large scale are a big problem for policy-making, so it would be very helpful to have a better understanding of how network architecture would react to policy changes before these policy changes take effect."

Bridging Technology and Economics

Vohra is on a mission to use his strong background in mathematics to address important societal issues. Two years ago, he came to Penn from Northwestern University through the Penn Integrates Knowledge program—a University-wide interdisciplinary initiative to recruit renowned scholars. As an expert in mechanism design, an innovative area of game theory that brings together engineering, economics and computer science, Vohra has pioneered new ways to design effective markets for purposes as diverse as the power grid, the electromagnetic spectrum for wireless communications, and the matching of medical students to teaching hospitals.

"Economics has transcended business and has become not only a business tool, but also an engineering tool. Penn is now leading the discussion on connecting the technological world with economic foundations," notes



George Pappas, Joseph Moore Professor and chair of ESE. “Rakesh is one of the few people who has clearly been in the center of this emerging research area.”

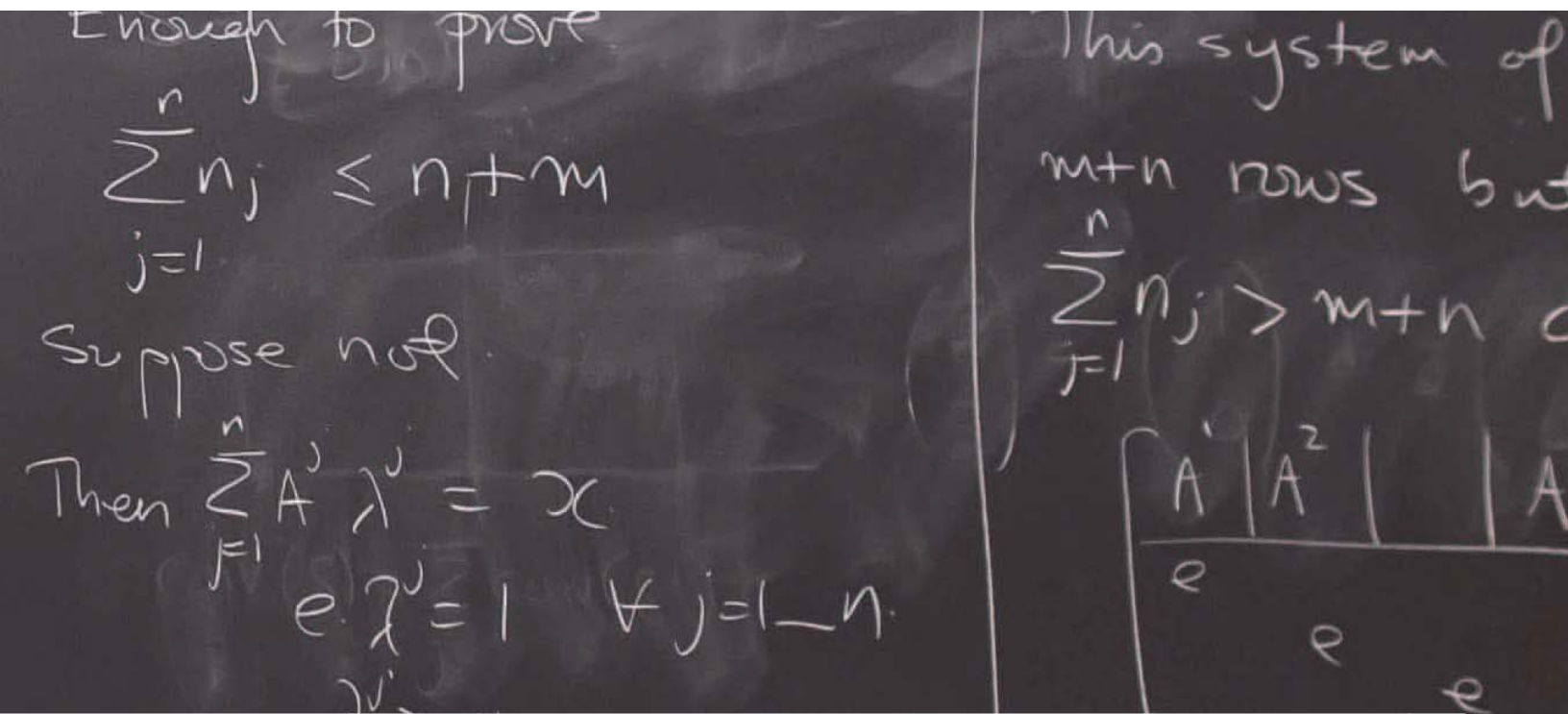
Solving Societal Problems

To study the economic roots of unfairness, Vohra is collaborating with Aaron Roth, Raj and Neera Singh Assistant Professor in Computer and Information Science (CIS), and Mallesh Pai, an assistant professor in Economics. Banks and insurance companies often use algorithms to decide the credit-worthiness of loan applicants or estimate the risk of payment default. But these algorithms could lead them to inadvertently discriminate on the basis of race, possibly due to the lack of data on underserved populations. “A simple economic argument would say that such unfairness should disappear in the face of competition,” Roth says. “If a population of credit-worthy individuals are being systematically denied loans by some financial institution, another one should jump at the opportunity to make money by serving this population and should be able to outcompete the unfair lender.”

Vohra and Roth are now working together to identify the factors that prevent this from happening. “I’m concerned that we may, by accident, end up in a world where we discriminate against various people simply because of the ways we choose to store and analyze data,” Vohra remarks. “Our findings will provide guidance to companies on how to collect and analyze data to avoid these kinds of mistakes.”

Connecting Networks to Behavior

When Vohra is not doing research, he keeps busy with leadership and teaching responsibilities. Together with Michael Kearns, National Center Professor of Management and Technology in CIS, Vohra co-directs the Warren Center for Network & Data Sciences. They have launched a vibrant speaker series and have selected and advised its first set of postdoctoral fellows. Through the Center’s initial wave of grant proposals, they are also mapping out research aims that unite diverse fields such as engineering, economics, sociology, psychology, astronomy, neuroscience, law and communications. The Warren Center, which was launched in



2013, serves as a complement to the undergraduate program in Networked & Social Systems Engineering, which began in 2011 as an unprecedented multidisciplinary program that connects the study of networks with the study of human behavior.

To teach students the connections between networks and human behavior, it's important to expose them to quantitative models for decision-making. With that goal in mind, Vohra developed a new course, ESE 204, Decision Models, which draws examples from manufacturing, finance, logistics and supply chain management. For example, a road may be built to relieve congestion in one part of a transportation network, only to unexpectedly increase congestion in another part of the network. "A decision may seem like a good idea at the local level, but globally there could be adverse impacts," Vohra states. "Humans are strategic and will respond to design changes in unintended ways. This is an important insight for engineers to understand."

Following Interesting Questions

According to Pai, one of Vohra's former doctoral students at Northwestern University, Vohra puts a lot of effort into designing novel courses and textbooks at the undergraduate, master's and doctoral levels. "In terms of teaching, what's striking, other than how good he is at it, is how seriously he takes it," Pai says. "As a past teaching assistant, I can attest to how well these thoughtfully designed courses, that aren't just following some textbook, are received by students."

Whether it's through research or teaching, Vohra is driven to probe at a deeper level the connections between the tools of engineering and economic theory, revealing elegant results that were previously thought beyond reach. "Following interesting questions is what led me to the intersection of engineering and economics," Vohra says. "I've been doing multidisciplinary research for a long time now, but I am still amazed at how useful math is for thinking about the world." ▾



Lloyd Howell

Lloyd Howell

Transforming Engineering Expertise into Innovative Ideas

By Janelle Weaver

When Lloyd Howell, EE'88, was just 7 or 8 years old, an uncle introduced him to the world of plastic models and radio-controlled airplanes. This childhood experience had a lasting influence, later inspiring the self-described “nerdy kid” to think about a career in electrical engineering. Having grown up in Philadelphia, the last thing he wanted to do was apply to Penn. “I wanted to get as far away as possible,” Howell recalls. “Since I grew up in Philadelphia and was very familiar with Penn’s campus, I was ready to experience something different. However, my mother passed away during my senior year in high school, and I decided that staying close to home was my best option.”

As a freshman at Penn, Howell soon discovered that his familiar surroundings had a lot more to offer. “I got to know the city I thought I knew much better, and made a lot of good friends that I still have today,” he says. To thrive in the challenging academic environment, Howell turned to supportive professors such as Joseph Bordogna, Alfred Fidler Moore Professor and Dean Emeritus; David Pope, professor in Materials Science and Engineering; and his advisor Jorge Santiago-Aviles, associate professor in Electrical and Systems

Engineering. “They had a very positive influence on me, and they helped me figure out what I wanted to do after Penn,” Howell notes.

Making a Positive Difference

Howell’s career path was also shaped in large part by his membership in Hexagon, the senior honor society of Penn Engineering. A friend in Hexagon who was going to become a consultant encouraged Howell to look into Booz Allen Hamilton, a leading provider of management consulting, technology and engineering services. Today, Howell is an Executive Vice President of the firm. As the leader of the Civil and Commercial Group, he is in charge of delivering strategic, technology and analytics services to federal and commercial clients, including the Departments of the Treasury, Health and Human Services, and Homeland Security, as well as global health, financial and energy clients in the commercial sector.

Before assuming his current role, Howell joined Booz Allen Hamilton in 1988 as a consultant, providing systems engineering support to multiple Department of Defense satellite programs. In 1991, he left the

Because Lloyd Howell has been blessed professionally, he has given back to Penn and the community that served him so well. Through Capital Partners for Education, he mentors students that come from disadvantaged backgrounds to help them overcome challenges with the transition from high school to college and give them the mentoring they need to succeed.

firm to get an MBA at Harvard Business School and subsequently worked at Goldman Sachs, a prominent global investment banking, securities and investment management firm. “At that point in my life, I was trying to figure out how to combine my different experiences to make the best decisions for me and my young family,” he remembers. “Those decisions led me back to Booz Allen Hamilton and the consulting field.”

After returning to the firm in 1995, Howell became a member of the Strategy and Organization Capability Team focused on defense clients such as the Armed Forces and the Office of the Secretary of Defense. He was later elected to the firm’s partnership and he currently serves on the Leadership Team and chairs the Ethics and Compliance Committee. Over the years, he has served on the firm’s Board and led efforts that evaluated the firm’s operating model, organizational structure, and people programs. “What I enjoy most about this job are the people and the friendships, and the fact that every day is not the same. It never gets stale,” Howell remarks. “It’s also gratifying to provide creative ideas and solutions to a range of clients and witness the difference and impact I’ve contributed to every day.”

Paying it Forward

Because Howell has been blessed professionally, he has given back to Penn and the community that served him so well. Through Capital Partners for Education, he mentors students that come from disadvantaged backgrounds to help them overcome challenges with

the transition from high school to college and give them the mentoring they need to succeed. As a corporate advisor to the not-for-profit organization known as Management Leadership for Tomorrow, he personally leads development sessions for talented minority students to help them reach their full leadership potential at different career stages. “At Penn, my wife and I also endowed a scholarship in my mother’s name, Jeannette D. Howell, for students like me: minority high school students who have an interest in engineering,” Howell states.

When Eduardo Glandt, Nemirovsky Family Dean, asked Howell if he would be willing to join Penn Engineering’s Board of Overseers, he jumped at the opportunity. As an Overseer, Howell has given advice on recruiting talented professors and minority students, increasing the diversity of the Board, and keeping the School competitive. According to Howell, the School’s leadership deserves a lot of credit for introducing new facilities that increase the energy level on campus, encouraging the integration of different disciplines across the entire University, and increasing the level of excitement in student experiences through real-world projects and competitions such as hackathons. “The application numbers speak volumes about how the School has gotten stronger and more competitive since I was a student,” Howell says. “More than other schools, Penn has a community of strong institutions and an incredible brand to leverage.”



Your Legacy at Penn Engineering

The character of Penn Engineering has been shaped and strengthened by generations of alumni and friends through Planned Giving. You have the opportunity to join them. A **planned gift** ensures that your philanthropy both maximizes the benefit of available tax incentives and generates enduring support for our students, faculty and campus.

You can create your legacy at Penn Engineering in a variety of ways, from **estate gifts** to **retirement plan assets** and **life income gifts**. Please contact Penn Engineering to learn more about the ways in which your planned gift can support the bright future of the School of Engineering and Applied Science.

Your gift qualifies you for membership in the Harrison Society.



Penn
Engineering

TO LEARN MORE ABOUT SUPPORTING
PENN ENGINEERING PLEASE CONTACT:
Devon M. Herrick
215-898-6564 • dherrick@seas.upenn.edu
www.seas.upenn.edu/giving

Honors & Awards



Dawn Bonnell, *Vice Provost for Research at Penn and Henry Robinson Towne Professor in Materials Science and Engineering*, was named Fellow of the Materials Research Society for “continuously expanding the ability of local probes to explore fundamental properties in complex materials, particularly oxides.”



Susan Davidson, *Weiss Professor in Computer and Information Science*, was elected Chair of the Computing Research Association (CRA) Board of Directors. She was also named a Corresponding Fellow of the Royal Society of Edinburgh, a body established in 1783 for the “advancement of learning and useful knowledge” in Scotland.



Scott Diamond, *Arthur E. Humphrey Professor and Chair of Chemical and Biomolecular Engineering*, and **Andrew Tsourkas**, *Professor in Bioengineering*, were elected Fellows of the American Institute for Medical and Biological Engineering for significant contributions to the medical and biological engineering community.



Nader Engheta, *H. Nedwill Ramsey Professor in Electrical and Systems Engineering*, is the recipient of the 2015 SPIE Gold Medal Award. Engheta was selected for his “groundbreaking contributions to optical engineering of metamaterials and nanoscale plasmonics, metamaterial-based optical nanocircuits, and biologically-inspired optical imaging.” Dr. Engheta was also named Fellow of the Materials Research Society.



Dan Huh, *Wilf Family Term Assistant Professor in Bioengineering*, was awarded the NIH New Innovator Award, a highly competitive grant of \$1.5 million during the next five years, to develop microfabricated systems that mimic diseased human lungs.



Michael Kearns, *National Center Professor of Management & Technology in Computer and Information Science*, was named Fellow of the Association for Computing Machinery for “contributions to machine learning, artificial intelligence, and algorithmic game theory and computational social sciences.”

Honors & Awards



Daniel Lee, Professor in Electrical and Systems Engineering, received the 2014-2015 Penn Alumni Faculty Award of Merit for his “outstanding contributions to alumni education and engagement by sharing his scholarship with the alumni community.”



George Pappas, Joseph Moore Professor and Chair of Electrical and Systems Engineering, received the 2015 George H. Heilmeier Faculty Award for Excellence in Research for “fundamental contributions to embedded, hybrid and networked control systems.”



Benjamin Pierce, Henry Salvatori Professor in Computer and Information Science, was awarded an honorary doctorate from the Chalmers University of Technology.



Ravi Radhakrishnan, Professor in Bioengineering, was elected Fellow of the American Institute for Medical and Biological Engineering for significant contributions to the medical and biological engineering community.



Aaron Roth, Raj and Neera Singh Assistant Professor in Computer and Information Science, and **Jennifer Phillips-Cremens**, Assistant Professor in Bioengineering, received Sloan Research Fellowships, which are presented to early-career scholars whose potential and achievements identify them as the next generation of scientific leaders.



David Srolovitz, Joseph Bordogna Professor in Materials Science and Engineering and Mechanical Engineering and Applied Mechanics, was elected to the National Academy of Engineering (NAE) for his accomplishments in “theory and simulation of microstructure and properties of materials and for his leadership in computational materials engineering.”

Teaching Awards



Robert Ghrist, *Andrea Mitchell University Professor*, is the recipient of a 2015 **Lindback Award for Distinguished Teaching**. Ghrist has taught at Penn since 2008, and holds appointments in the Departments of Electrical and Systems Engineering and Mathematics. "As fearless in his teaching as he is in his research," he is, in the words of a colleague, "a driving taskmaster in the classroom whom the students also love...a restless inventor, constantly daydreaming about better ways to teach, about how to unlock ever deeper concepts for ever broader audiences, leveraging the hottest new technologies available."

Indeed, he "has dared to push students far beyond conventionally accepted boundaries" by deploying new forms of active in-class learning and reinventing ESE 210, Dynamical Systems, and the engineering calculus core sequence in the math department. His pioneering online course, Calculus: Single Variable, reinvents the structure and delivery of a calculus curriculum and became one of the only online courses approved for college credit by the American Council on Education. "By far the most brilliant and caring professor I have ever had," in the words of one student, he "managed to instill energy into derivatives, impart intrigue to integrals and bring life to differential equations. He made the imaginary seem real and the seventh dimension feel as natural as the third."



Cherie Kagan, *Stephen J. Angello Professor in Electrical and Systems Engineering*, has been awarded the **S. Reid Warren, Jr. Award**, which is presented annually by the undergraduate student body and the Engineering Alumni Society in recognition of outstanding service in stimulating and guiding the intellectual and professional development of undergraduate students.



Paulo Arratia, *Associate Professor in Mechanical Engineering and Applied Mechanics*, has been awarded the **Ford Motor Company Award for Faculty Advising**. The award recognizes dedication to helping students realize their educational, career and personal goals.



LeAnn Dourte, *Lecturer in Bioengineering*, has been awarded the **Hatfield Award for Excellence in Teaching in the Lecturer and Practice Professor Track**. The award recognizes outstanding teaching ability, dedication to innovative undergraduate instruction, and exemplary service to the School in consistently inspiring students in the engineering and scientific profession.

University Launches Penn Wharton China Center

University of Pennsylvania Provost Vincent Price and eight deans, including Penn Engineering’s **Eduardo D. Glandt**, *Nemirovsky Family Dean*, participated in the dedication of the Penn Wharton China Center (PWCC) in Beijing, China, on March 10, 2015. The Center is an important expansion of Penn’s engagement with China, which began in 1896 when the first Chinese student enrolled at Penn. The Center will serve as a valuable resource and vibrant gathering place, enhancing learning and research opportunities to the benefit of Penn’s faculty, students, alumni and friends in China. The Center will also be the nexus for collaboration and outreach to the Chinese community.

To celebrate the opening, a conclave of the top 25 Chinese university leaders participated in a two-day series of academic discussions featuring topics in higher education, panel discussions with senior Chinese business leaders and Penn scholars, and research talks with Penn faculty, including a presentation, “Human, Robotics, and Social Perception: Research Highlights of the Penn GRASP Lab,” by **Jianbo Shi**, *Professor in Computer and Information Science*.

Inaugural NETS Class Graduates

On March 19, 2015, the inaugural class of the Singh Program in Networked & Social Systems Engineering gathered to celebrate its first graduating class with a special lecture by Susan Gardner and celebratory dinner. NETS program benefactor Raj Singh was on hand for the event.

Gardner’s lecture, “The Future of the Internet,” was presented in Wu and Chen Auditorium to a packed house. Gardner, former director of and now special advisor to Wikipedia, is one of *Forbes* “100 Most Powerful Women.” At Wikipedia, Gardner introduced major initiatives focused on organizational maturity, long-term sustainability, and increased participation, reach and quality of the Foundation’s free-knowledge projects.

Shiro Takashima, *Professor Emeritus in the Department of Bioengineering*, passed away on March 14, 2015. He was 91.

Dr. Takashima earned his undergraduate degree in Biology in 1947 and his Ph.D. in Biochemistry in 1954, both from the University of Tokyo in Japan. During his doctoral work, he served as an instructor at the University of Tokyo. After receiving his degree, he came to the United States and was a postdoctoral research fellow in the School of Chemistry at the University of Minnesota from 1955 to 1957. He then worked as a research associate at The Moore School of Electrical Engineering (now part of Penn Engineering) at the University of Pennsylvania from 1957 to 1959. Dr. Takashima returned to Japan in 1959 and for several years was a faculty member at the University of Tokyo and later Osaka University.

His career on the faculty at Penn began with his return to the U.S. in 1964 when he was hired as an assistant professor. He was promoted to associate professor in 1970, and became a full professor in 1975. Dr. Takashima was one of the founding members of Penn’s Department of Bioengineering, and served as the Bioengineering Graduate Group Chair from 1976 to 1978. He was a close colleague of the late Herman Schwan.

Known for his work on the physical and electrical properties of membranes, in what would now be considered the field of neuroengineering, Dr. Takashima began his career with seminal work on the effects of electric fields on altering the function of important biological materials, such as DNA, hemoglobin, and albumin. He later explored the functional properties of individual cells after they were exposed to electric fields, leading to a focus on the mechanisms regulating the propagation of electrical signaling in axons and exposing new insights into how neuronal networks are developed and maintained over their lifetimes. Dr. Takashima is the author of *Electrical Properties of Biopolymers and Membranes*, a comprehensive book and key reference in this field.

Dr. Takashima is survived by his wife Yuki; his children Nozomi and Makato; and his grandchildren Matteo, Masao, Kenji, and Jamie.



Kilian Feeney

*Director of Engineering Operations Services (EOS)
at Penn Engineering*

What is your role within Penn Engineering?

In my position, I support the academic and research missions of the School through the oversight of building operations, maintenance, construction and events management.

How did you come to work at Penn?

Before my five years at Penn Engineering, I started at the School of Nursing, where I spent two years as the Building and Operations Manager for Fagin Hall. I began my career in Facilities and Project Management with the Archdiocese of Philadelphia, where I worked for six years.

Is there such a thing as a typical day for you?

Each day is different, which I like, but my day always begins with a review of our utility infrastructure and ends with a daily report for the School's CIO. What happens between those two constants always varies, especially as the needs of the School evolve. A recent day saw me checking on the progress of the Active Learning Classroom renovation (pictured), meeting with faculty and staff to devise solutions for better lab safety, advising PennApps students on venue selection, contacting the FAA to gain approval for a student club weather balloon launch, preparing a Mission Continuity report for the EVP's office and meeting with EOS staff to devise improvements to maintenance response times.

What aspect of your position do you enjoy most?

My job requires me to be resourceful. I enjoy building and maintaining strong relationships with both internal and external University stakeholders in an effort to support the School. I never know who I may need to call for assistance and collaboration, and I have everyone from housekeeping to executives at Comcast in my address book, and I value them all equally.

How do you like to spend your free time?

I am a former Division I soccer athlete, so I like to stay active in my spare time and recently started taking a Krav Maga class. I've also taught myself how to code and enjoy learning new languages. ▾

Penn Engineering Board of Overseers

Mr. Andrew S. Rachleff, W'80
Board Chair
Partner
Benchmark Capital
Menlo Park, CA

Mr. Andrew Africk, L'92, WG'92
CEO
Searay Capital LLC
New York, NY

The Honorable Harold Berger, EE' 48, L'51
Managing Partner
Berger and Montague, P.C.
Philadelphia, PA

Mr. David J. Berkman, W'83
Managing Partner
Liberty Associated Partners, L.P.
Bala Cynwyd, PA

Mr. Dennis "Chip" Brady, C'94, W'94
Partner
LSN Partners, LLC
Miami, FL

Dr. Katherine D. Crothall, EE'71
Principal
Liberty Venture Partners, Inc.
Philadelphia, PA

Mr. Peter N. Detkin, Esq., EE'82, L'85
Co-Founder, Vice-Chairman
Intellectual Ventures
Palo Alto, CA

Mr. Richard D. Forman, EE'87, W'87
Managing Partner
Health Venture Group
New York, NY

Mr. Paul S. Greenberg, EE'83, WG'87
Managing Member & CEO
Lutetium Capital, LLC
Stamford, CT

Mr. Alex Haidas, C'93, ENG'93, WG'98
Founder
Bluewall Capital Ltd.
London, UK

Mr. Jeff Horing, ENG'86, W'86
Co-Founder and Managing Director
Insight Capital Partners
New York, NY

Mr. Lloyd W. Howell, Jr., EE'88
Executive Vice President
Booz Allen Hamilton, Inc.
Washington, DC

Mr. Alex T. Krueger, ENG'96, W'96
Co-CEO and President
First Reserve Corporation
London, UK

Dr. John F. Lehman, Jr., GR'74
Chairman and Founding Partner
J.F. Lehman & Company
New York, NY

Mr. Ryan D. Limaye
ENG'93, W'93, WG'93
Managing Director & Head
Goldman Sachs Group, Inc.
San Francisco, CA

Dr. David M. Magerman, C'90, ENG'90
President and Founder
Kohélet Foundation
Gladwyne, PA

Mr. Hital R. Meswani, ENG'90, W'90
Executive Director and
Member of the Board
Reliance Industries Limited
Mumbai, India

Mr. Rajeev Misra, ME'85, GEN'86
Global Head of Credit
UBS Investment Bank
London, UK

Mr. Ofer Nemirovsky, EE'79, W'79
Managing Director
HarbourVest Partners, LLC
Boston, MA

Ms. Alison Newman, C'83
Partner
Fox Rothschild, LLP
New York, NY

Mr. Mitchell I. Quain, EE'73, parent
Board Chair Emeritus
Senior Advisor
Carlyle Group
New York, NY

Mr. Allie P. Rogers, ENG'87, W'87
Co-Founder
Triple Point Technology, Inc.
Old Greenwich, CT

Dr. Jeffrey M. Rosenbluth, ENG'84
Private Investor
Sands Point, NY

Ms. Suzanne Rowland, ChE'83
VP & General Manager
Global Special Hazards, Tyco
Lansdale, PA

Mr. Theodore E. Schlein, C'86
Managing Partner
Kleiner Perkins Caufield & Byers
Menlo Park, CA

Dr. Krishna P. Singh, MS'69, PhD'72
President and CEO
Holtec International
Marlton, NJ

Dr. Rajendra Singh, parent
Chairman and CEO
Telcom Ventures LLC
Alexandria, VA

Ms. Juliet Sjöborg, EE'85, WG'92
Director
Plena Capital Ltd.
London, UK

Mr. Robert M. Stavis, EAS'84, W'84
Partner
Bessemer Venture Partners
Larchmont, NY

Mr. Alex Stern, ENG'89, WG'94
Chief Operating Officer, Global Head
of Strategy and Managing Director
Lazard Ltd
New York, NY

Mr. Harlan M. Stone, C'80
President and COO
Halstead International
Norwalk, CT

Mr. Michael Ward, EAS'85, W'85
Managing Director, COO and
Chief Executive Officer
Bain Capital LLC
Boston, MA

Mr. Frederick J. Warren, ME'60, WG'61
Founder
Sage Venture Partners, LLC
Winter Park, FL

Ms. Sarah Keil Wolf, EE'86, W'86
Retired Investment Banker
Bear Stearns and Company
Scarsdale, NY

Dr. Michael D. Zisman, GEE'73, GR'77
Managing Director, Operations
Internet Capital Group
Wayne, PA

University of Pennsylvania Nondiscrimination Statement

The University of Pennsylvania values diversity and seeks talented students, faculty and staff from diverse backgrounds. The University of Pennsylvania does not discriminate on the basis of race, color, sex, sexual orientation, gender identity, religion, creed, national or ethnic origin, citizenship status, age, disability, veteran status or any other legally protected class status in the administration of its admissions, financial aid, educational or athletic programs, or other University-administered programs or in its employment practices. Questions or complaints regarding this policy should be directed to Sam Starks, Executive Director of the Office of Affirmative Action and Equal Opportunity Programs, Sansom Place East, 3600 Chestnut Street, Suite 228, Philadelphia, PA 19104-6106; or (215) 898-6993 (Voice).



School of Engineering and Applied Science
University of Pennsylvania

123 Towne Building
220 South 33rd Street
Philadelphia, PA 19104-6391

Non Profit Org.
U.S. Postage
PAID
Permit No. 2563
Philadelphia, PA



WWW.SEAS.UPENN.EDU